# T07D01 – (7.1) ****Dynamic Equilibrium Notes****

Name ……………………………………………………..

1. 7.1.1 Outline the characteristics of chemical and physical systems in a state of equilibrium. (2)
   1. What is different about an open system and a closed system?
   2. Equilibrium can be established only when one of the above situations occurs. Using a diagram show what happens to the H2O particles when in equilibrium in this system.
   3. Describe, using a diagram and explanation, how Br2 can be in equilibrium:

|  |  |  |  |
| --- | --- | --- | --- |
| **Situation** | **Water in Open System** | **Water in Closed System** | **Bromine in Closed System** |
| **Diagram** |  |  |  |
| **Explanation** |  |  |  |

* 1. Each of the above situations are in Physical Equilibria, explain what that means:
  2. The sign for equilibrium (⇌) is very important, describe why an IB moderator might mark you down for using a complete arrow (🡪) by accident:
  3. What is the difference between static equilibrium and dynamic equilibrium:

|  |  |
| --- | --- |
| **Static Equilibrium** | **Dynamic Equilibrium** |
|  |  |

* 1. The dynamic equilibrium of soda can change when the pressure of a bottle is released, provide a diagram and explanation for each of the following situations

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
|  | **Closed Coke Bottle** | **Open Coke Bottle** | **Open Coke Bottle with Mentos** | **Previously opened (not closed) coke bottle in the sun** |
| **Diagram** |  |  |  |  |
| **Explanation** |  |  |  |  |

* 1. How is chemical equilibrium different than physical equilibrium?
  2. Two common examples are (1) the test for Fe3+ ions in solution, and (2) the decomposition or formation of HI. Complete the following table for each situation:

|  |  |  |
| --- | --- | --- |
|  | **Fe3+(aq) + SCN-(aq) ⇌ [Fe(SCN)]2+(aq)** | **2HI(g) ⇌ H2(g) + I2(g)** |
| **Color Changes** |  |  |
| **How can the equilibrium be shifted?** |  |  |
| **How can the equilibrium be monitored?** |  |  |
| **If the reaction “lies to the right”** |  |  |
| **If the reaction “lies to the left”** |  |  |
| **When the reaction is in dynamic equilibrium, what are the rates?** |  |  |

* 1. In an example using 2HI(g) ⇌ H2(g) + I2(g), demonstrate that the equilibrium is not dependent on where the reaction starts (favouring reactants or products):

|  |  |  |
| --- | --- | --- |
|  | **Starting with HI(g)** | **Starting with H2 and I2** |
| **Diagram** |  |  |

* 1. Explain why the concentrations of reactants and products are not equal even though they are constant:
  2. Use the escalator analogy to describe how a reaction can “lie to the left” or “lie to the right”:
  3. I’m nice, so I put this chart on your notes for you ☺

|  |  |  |
| --- | --- | --- |
|  | **Feature of equilibrium state** | **Explanation** |
| 1 | Equilibrium is dynamic | Reaction has not stopped but both forward and reverse are in same rate |
| 2 | Equilibrium is achieved in a closed system | Prevents exchange of matter with surroundings, so equilibrium is achieved where both R and P can react and recombine |
| 3 | Concentrations of R and P remain constant at equilibrium | They are being produced and destroyed at an equal rate |
| 4 | At equilibrium there is no change in macroscopic properties | Refers to observable properties such as color and density. Do not change as they depend on [conc] of the components of the mixture |
| 5 | Equilibrium can be reached from either direction | The same equilibrium mixture will result under same conditions, no matter whether the reaction is started with all R, P, or mixture of both |